



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/681,422	10/08/2003	William J. van Ooij	UOC / 171	7421
26875 7590 03/18/2008 WOOD, HERRON & EVANS, LLP 2700 CAREW TOWER 441 VINE STREET CINCINNATI, OH 45202				
EXAMINER				
FEELY, MICHAEL J				
ART UNIT		PAPER NUMBER		
1796				
MAIL DATE		DELIVERY MODE		
03/18/2008		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/681,422

Applicant(s)

VAN OOIJ ET AL.

Examiner

Michael J. Feely

Art Unit

1796

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 February 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 26-43, 46-55, 97 and 99 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 26-43, 46-55, 97 and 99 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Pending Claims

Claims 26-43, 46-55, 97, and 99 are pending.

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 14, 2008 has been entered.

Response to Amendment

2. The declaration under 37 CFR 1.132 filed February 14, 2008, *in concert with the amendment to claims 26 & 46*, is sufficient to overcome the supporting reference of Pines (US 3,088,847). The Pines reference fails to disclose: sulfur-curing of rubbers with his intermediate silane primer; and the presence bis-silanes in his silane primer composition. These two factors *(now featured in the instant invention)* diminish the analogous nature of Pines, with respect to the primary prior art. The chemical reactions of the bonding mechanism *(between rubber and silane)* in Pines are different from those set forth in the primary references *(and instant claims)*. Therefore, an expectation of success is not obviously envisaged when adapting the coating thicknesses of Pines to the primary references *(and instant claims)*.

3. The rejection of claim 98 under 35 U.S.C. 103(a) as being unpatentable over Van Ooij et al. (WO 00/63462) in view of Pines (US Pat. No. 3,088,847) has been rendered moot by the cancellation of this claim.
4. The rejection of claims 26-35, 41-43, and 97 under 35 U.S.C. 103(a) as being unpatentable over Van Ooij et al. (WO 00/63462) in view of Pines (US Pat. No. 3,088,847) has been withdrawn.
5. The rejection of claim 100 under 35 U.S.C. 103(a) as being unpatentable over the combined teaching of Van Ooij et al. (WO 00/63462) and Pines (US Pat. No. 3,088,847) in view of Shimakura et al. (US Pat. No. 6,475,300) has been rendered moot by the cancellation of this claim.
6. The rejection of claims 36-40, 46-55, and 99 under 35 U.S.C. 103(a) as being unpatentable over the combined teaching of Van Ooij et al. (WO 00/63462) and Pines (US Pat. No. 3,088,847) in view of Shimakura et al. (US Pat. No. 6,475,300) has been withdrawn.
7. The rejection of claim 98 under 35 U.S.C. 103(a) as being unpatentable over Van Ooij et al. (US Pat. No. 6,416,869) in view of Pines (US Pat. No. 3,088,847) has been rendered moot by the cancellation of this claim.
8. The rejection of claims 26-35, 41-43, and 97 under 35 U.S.C. 103(a) as being unpatentable over Van Ooij et al. (US Pat. No. 6,416,869) in view of Pines (US Pat. No. 3,088,847) has been withdrawn.
9. The rejection of claims 100 under 35 U.S.C. 103(a) as being unpatentable over the combined teaching of Van Ooij et al. (US Pat. No. 6,416,869) and Pines (US Pat. No. 3,088,847)

in view of Shimakura et al. (US Pat. No. 6,475,300) has been rendered moot by the cancellation of this claim.

10. The rejection of claims 36-40, 46-55, and 99 under 35 U.S.C. 103(a) as being unpatentable over the combined teaching of Van Ooij et al. (US Pat. No. 6,416,869) and Pines (US Pat. No. 3,088,847) in view of Shimakura et al. (US Pat. No. 6,475,300) has been withdrawn.

11. The rejection of claim 98 under 35 U.S.C. 103(a) as being unpatentable over Van Ooij et al. (US Pat. No. 6,756,079) in view of Pines (US Pat. No. 3,088,847) has been rendered moot by the cancellation of this claim.

12. The rejection of claims 26-35, 41-43, and 97 under 35 U.S.C. 103(a) as being unpatentable over Van Ooij et al. (US Pat. No. 6,756,079) in view of Pines (US Pat. No. 3,088,847) has been withdrawn.

13. The rejection of claim 100 under 35 U.S.C. 103(a) as being unpatentable over the combined teaching of Van Ooij et al. (US Pat. No. 6,756,079) and Pines (US Pat. No. 3,088,847) in view of Shimakura et al. (US Pat. No. 6,475,300) has been rendered moot by the cancellation of this claim.

14. The rejection of claims 36-40, 46-55, and 99 under 35 U.S.C. 103(a) as being unpatentable over the combined teaching of Van Ooij et al. (US Pat. No. 6,756,079) and Pines (US Pat. No. 3,088,847) in view of Shimakura et al. (US Pat. No. 6,475,300) has been withdrawn.

15. The rejection of claim 98 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the combined limitations of claims 7-19, 24-31 & 33 of

U.S. Patent No. 6,756,079 in view of Pines (US Pat. No 3,088,847) has been rendered moot by the cancellation of this claim.

16. The rejection of claims 26-35, 41-43, and 97 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the combined limitations of claims 7-19, 24-31 & 33 of U.S. Patent No. 6,756,079 in view of Pines (US Pat. No 3,088,847) has been withdrawn.

17. The rejection of claim 100 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the combined limitations of claims 7-19, 24-31 & 33 of U.S. Patent No. 6,756,079 in view of Pines (US Pat. No 3,088,847) and Shimakura et al. (US Pat. No. 6,475,300) has been rendered moot by the cancellation of this claim.

18. The rejection of claims 36-40, 46-55, and 99 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the combined limitations of claims 7-19, 24-31 & 33 of U.S. Patent No. 6,756,079 in view of Pines (US Pat. No 3,088,847) and Shimakura et al. (US Pat. No. 6,475,300) has been withdrawn.

Response to Arguments

19. Applicant's arguments, see pages 12-21, filed February 14, 2008, with respect to the supporting reference of Pines (US 3,088,847) have been fully considered and are persuasive. The arguments reiterate the points made in the 1.132 declaration. Therefore, the rejections relying upon the support of Pines have been withdrawn. However, upon further consideration of the primary references, a new ground(s) of rejection is made based in *inherency*.

Claim Rejections - 35 USC § 102/103

20. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

21. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

22. Claims 26-35, 42, 43, and 97 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Van Ooij et al. (WO 00/63462).

Regarding claims 26-35, 42, 43, and 97, Van Ooij et al. disclose: (26) a method of bonding *rubber* to a metal substrate (Abstract; page 15, lines 3-25), the method comprising:

(a) applying a silane solution comprising a substantially hydrolyzed bis amino-silane and a substantially hydrolyzed bis sulfur-containing silane to at least a portion of a surface of a metal substrate (page 10, line 21 through page 18, line 22, *particularly page 10, line 21 through page 11, line 13*);

(b) drying the silane solution on the metal substrate to form a coating (page 14, lines 3-13); and (3) applying an uncured *sulfur curable rubber* onto the surface of the metal substrate having the coating thereon and *sulfur curing* the *rubber* to bond the *rubber* to the coated metal substrate (page 14, line 14 through page 16, line 2, *particularly page 15, lines 3-8*);

(27) further comprising, prior to applying the solution: mixing a bis amino-silane and a bis sulfur-containing silane separately with an aqueous-based medium to substantially hydrolyze the bis amino-silane and the bis sulfur silane; and mixing the hydrolyzed bis amino-silane and the hydrolyzed bis sulfur-containing silane together to form the solution to be applied to the metal substrate (page 11, lines 1-13); (28) wherein the aqueous-based medium comprises water and alcohol (page 11, lines 1-13); (29) wherein the amino-silane is a compound of the general formula (I) *see claim for details* (page 16, line 3 through page 17, line 13); (30) wherein the bis amino silane is selected from the group consisting bis(trimethoxysilylpropyl)ethylene diamine, bis(trimethoxysilylpropyl) amine, and combinations thereof (page 16, line 3 through page 17, line 13); (31) wherein the bis sulfur-containing silane is a compound of the general formula (II) *see claim for details* (page 17, line 14 through page 18, line 22); (32) wherein the bis sulfur-containing silane is selected from the group consisting of bis(trimethoxysilylpropyl) disulfide,

bis(trimethoxysilylpropyl) tetrasulfide, and combinations thereof (page 17, line 14 through page 18, line 22);

(33) wherein the solution comprises a ratio of the hydrolyzed bis amino-silane to the hydrolyzed bis sulfur-containing silane in a range from about 1:4 to about 4:1 by volume (page 13, lines 6-10);

(34) wherein the solution comprises a ratio of the hydrolyzed bis amino-silane to the hydrolyzed bis sulfur-containing silane of about 1:1 by volume (page 13, lines 6-10);

(35) wherein applying the solution to the metal substrate comprises dipping the metal substrate in the solution (page 13, lines 21 through page 14, line 2; page 24, lines 16-19);

(43) wherein curing comprises applying heat and pressure to the *rubber* and coated metal substrate to form a bond there between (page 24, lines 20-26); and

(97) wherein the *sulfur curable* rubber is selected from the group consisting of natural rubber, synthetic rubber, and combinations thereof (page 15, lines 3-25).

Van Ooij et al. fail to explicitly disclose: (26) a coating thickness in the range from about 0.1 μm to about 1 μm ; and (42) a coating thickness in the range from about 0.2 μm to about 0.6 μm . Rather, they disclose coating conditions featuring: (a) mixed hydrolyzed silane solutions at 5% volume; (b) a dipping technique; (c) an immersion time of 30-45 seconds; and (d) subsequent drying (*Example 1: see page 22, line 26 through page 27, line 26; particularly page 24, lines 3-19*).

Turning to the instant specification, Applicant discloses: "As discussed above, coating thicknesses may be determined by *concentration of the silane solution and length of contact time* between the solution and the metal. For example, a 5% silane solution contacted with the metal

for *at least about 30 seconds* generally provides a film thickness of *about 0.3 μm to about 0.4 μm* after drying,” (see paragraph 0048 of the Specification or paragraph 0080 of the corresponding pre-publication).

In addition to disclosing the instantly claimed metal substrate, silane solution, and sulfur cured rubber, Van Ooij et al. also disclose the same coating parameters utilized in the instant invention, including concentration of the silane solution and length of contact time between the solution and the metal. By Applicant's own admission, *a 5% silane solution* contacted with the metal for *at least about 30 seconds* generally provides a film thickness of *about 0.3 μm to about 0.4 μm* after drying. Furthermore, it should be noted that there is no evidence to suggest that this relationship between coating parameters and coating thickness is exclusive to the instant invention. In light of this, it appears that the method of Van Ooij et al. would have inherently provided a coating thickness in the range from about 0.1 μm to about 1 μm (*preferably in the range from about 0.2 μm to about 0.6 μm*). Otherwise, the method of Van Ooij et al. would have rendered the instant invention obvious because their method yields a composite material featuring improved adhesion characteristics between a metal substrate and a sulfur cured rubber (see page 4, lines 6-9; pages 24-27 of Van Ooij et al.)

Therefore, if not explicitly taught by Van Ooij et al., then the method of Van Ooij et al. would have rendered the instant invention obvious because their method yields a composite material featuring improved adhesion characteristics between a metal substrate and a sulfur cured rubber.

23. Claims 26-35, 42, 43, and 97 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Van Ooij et al. (US Pat. No. 6,416,869).

Regarding claims 26-35, 42, 43, and 97, Van Ooij et al. disclose: **(26)** a method of bonding *rubber* to a metal substrate (Abstract; column 9, lines 12-41), the method comprising:

(a) applying a silane solution comprising a substantially hydrolyzed bis amino-silane and a substantially hydrolyzed bis sulfur-containing silane to at least a portion of a surface of a metal substrate (column 6, line 28 through column 11, line 46, *particularly column 6, lines 28-47*);

(b) drying the silane solution on the metal substrate to form a coating (column 8, lines 37-51); and

(c) applying an uncured *sulfur curable rubber* onto the surface of the metal substrate having the coating thereon and *sulfur curing* the *rubber* to bond the *rubber* to the coated metal substrate (column 8, line 52 through column 9, line 52);

(27) further comprising, prior to applying the solution: mixing a bis amino-silane and a bis sulfur-containing silane separately with an aqueous-based medium to substantially hydrolyze the bis amino-silane and the bis sulfur silane; and mixing the hydrolyzed bis amino-silane and the hydrolyzed bis sulfur-containing silane together to form the solution to be applied to the metal substrate (column 6, lines 43-47); **(28)** wherein the aqueous-based medium comprises water and alcohol (column 6, lines 29-47); **(29)** wherein the bis amino-silane is a compound of the general formula (I) *see claim for details* (column 9, line 42 through column 10, line 65); **(30)** wherein the bis amino silane is selected from the group consisting bis(trimethoxysilylpropyl)ethylene diamine, bis(trimethoxysilylpropyl) amine, and combinations thereof (column 9, line 42 through column 10, line 65); **(31)** wherein the bis sulfur-containing

silane is a compound of the general formula (II) *see claim for details* (column 10, line 66 though column 12, line 27); (32) wherein the bis sulfur-containing silane is selected from the group consisting of bis(trimethoxysilylpropyl) disulfide, bis(trimethoxysilylpropyl) tetrasulfide, and combinations thereof (column 10, line 66 though column 12, line 27);

(33) wherein the solution comprises a ratio of the hydrolyzed bis amino-silane to the hydrolyzed bis sulfur-containing silane in a range from about 1:4 to about 4:1 by volume (column 7, line 59 through column 8, line 18);

(34) wherein the solution comprises a ratio of the hydrolyzed bis amino-silane to the hydrolyzed bis sulfur-containing silane of about 1:1 by volume (column 7, line 59 through column 8, line 18);

(35) wherein applying the solution to the metal substrate comprises dipping the metal substrate in the solution (column 8, line 19-36);

(43) wherein curing comprises applying heat and pressure to the *rubber* and coated metal substrate to form a bond there between (column 15, lines 10-18); and

(97) wherein the *sulfur curable* rubber is selected from the group consisting of natural rubber, synthetic rubber, and combinations thereof (column 9, lines 12-41).

Van Ooij et al. fail to explicitly disclose: (26) a coating thickness in the range from about 0.1 μm to about 1 μm ; and (42) a coating thickness in the range from about 0.2 μm to about 0.6 μm . Rather, they disclose coating conditions featuring: (a) mixed hydrolyzed silane solutions at 5% volume; (b) a dipping technique; (c) an immersion time of 30-45 seconds; and (d) subsequent drying (*Example 1: see column 14, line 53 through column 16, line 44, particularly column 15, lines 4-9*).

Turning to the instant specification, Applicant discloses: "As discussed above, coating thicknesses may be determined by *concentration of the silane solution and length of contact time* between the solution and the metal. For example, *a 5% silane solution* contacted with the metal for *at least about 30 seconds* generally provides a film thickness of *about 0.3 μm to about 0.4 μm* after drying," (see paragraph 0048 of the Specification or paragraph 0080 of the corresponding pre-publication).

In addition to disclosing the instantly claimed metal substrate, silane solution, and sulfur cured rubber, Van Ooij et al. also disclose the same coating parameters utilized in the instant invention, including concentration of the silane solution and length of contact time between the solution and the metal. By Applicant's own admission, *a 5% silane solution* contacted with the metal for *at least about 30 seconds* generally provides a film thickness of *about 0.3 μm to about 0.4 μm* after drying. Furthermore, it should be noted that there is no evidence to suggest that this relationship between coating parameters and coating thickness is exclusive to the instant invention. In light of this, it appears that the method of Van Ooij et al. would have inherently provided a coating thickness in the range from about 0.1 μm to about 1 μm (*preferably in the range from about 0.2 μm to about 0.6 μm*). Otherwise, the method of Van Ooij et al. would have rendered the instant invention obvious because their method yields a composite material featuring improved adhesion characteristics between a metal substrate and a sulfur cured rubber (see Summary of Invention and Example 1 of Van Ooij et al.)

Therefore, if not explicitly taught by Van Ooij et al., then the method of Van Ooij et al. would have rendered the instant invention obvious because their method yields a composite

material featuring improved adhesion characteristics between a metal substrate and a sulfur cured rubber.

24. Claims 26-35, 42, 43, and 97 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Van Ooij et al. (US Pat. No. 6,756,079).

Regarding claims 26-35, 42, 43, and 97, Van Ooij et al. disclose: (26) a method of bonding *rubber* to a metal substrate (Abstract; column 9, lines 21-50; *claims 7-19, 24-31 & 33*), the method comprising:

(a) applying a silane solution comprising a substantially hydrolyzed bis amino-silane and a substantially hydrolyzed bis sulfur-containing silane to at least a portion of a surface of a metal substrate (column 6, line 39 through column 11, line 50; *claims 7-19, 24-31 & 33*);

(b) drying the silane solution on the metal substrate to form a coating (column 8, lines 46-60; *claims 7-19, 24-31 & 33*); and

(c) applying an uncured *sulfur curable rubber* onto the surface of the metal substrate having the coating thereon and *sulfur curing* the *rubber* to bond the *rubber* to the coated metal substrate (column 8, line 61 through column 9, line 61; *claims 7-19, 24-31 & 33*);

(27) further comprising, prior to applying the solution: mixing a bis amino-silane and a bis sulfur-containing silane separately with an aqueous-based medium to substantially hydrolyze the bis amino-silane and the bis sulfur silane; and mixing the hydrolyzed bis amino-silane and the hydrolyzed bis sulfur-containing silane together to form the solution to be applied to the metal substrate (column 6, lines 54-58; *claims 7-19, 24-31 & 33*); (28) wherein the aqueous-based medium comprises water and alcohol (column 6, lines 40-58; *claims 7-19, 24-31 & 33*);

Art Unit: 1796

(29) wherein the bis amino-silane is a compound of the general formula (I) *see claim for details* (column 9, line 51 through column 11, line 8; *claims 7-19, 24-31 & 33*); (30) wherein the bis amino silane is selected from the group consisting bis(trimethoxysilylpropyl)ethylene diamine, bis(trimethoxysilylpropyl) amine, and combinations thereof (column 9, line 51 through column 11, line 8; *claims 7-19, 24-31 & 33*); (31) wherein the bis sulfur-containing silane is a compound of the general formula (II) *see claim for details* (column 11, line 9 though column 12, line 29; *claims 7-19, 24-31 & 33*); (32) wherein the bis sulfur-containing silane is selected from the group consisting of bis(trimethoxysilylpropyl) disulfide, bis(trimethoxysilylpropyl) tetrasulfide, and combinations thereof (column 11, line 9 though column 12, line 29; *claims 7-19, 24-31 & 33*);

(33) wherein the solution comprises a ratio of the hydrolyzed bis amino-silane to the hydrolyzed bis sulfur-containing silane in a range from about 1:4 to about 4:1 by volume (column 8, lines 1-27; *claims 7-19, 24-31 & 33*);

(34) wherein the solution comprises a ratio of the hydrolyzed bis amino-silane to the hydrolyzed bis sulfur-containing silane of about 1:1 by volume (column 8, lines 1-27; *claims 7-19, 24-31 & 33*);

(35) wherein applying the solution to the metal substrate comprises dipping the metal substrate in the solution (column 8, line 28-45; *claims 7-19, 24-31 & 33*);

(43) wherein curing comprises applying heat and pressure to the *rubber* and coated metal substrate to form a bond there between (column 15, lines 11-19; *claims 7-19, 24-31 & 33*); and

(97) wherein the *sulfur curable rubber* is selected from the group consisting of natural rubber, synthetic rubber, and combinations thereof (column 9, lines 21-50; *claims 7-19, 24-31 & 33*).

Van Ooij et al. fail to explicitly disclose: (26) a coating thickness in the range from about 0.1 μm to about 1 μm ; and (42) a coating thickness in the range from about 0.2 μm to about 0.6 μm . Rather, they disclose coating conditions featuring: (a) mixed hydrolyzed silane solutions at 5% volume; (b) a dipping technique; (c) an immersion time of 30-45 seconds; and (d) subsequent drying (*Example 1: see column 14, line 55 through column 16, line 45, particularly column 15, lines 6-10*).

Turning to the instant specification, Applicant discloses: "As discussed above, coating thicknesses may be determined by *concentration of the silane solution* and *length of contact time* between the solution and the metal. For example, *a 5% silane solution* contacted with the metal for *at least about 30 seconds* generally provides a film thickness of *about 0.3 μm to about 0.4 μm* after drying," (*see paragraph 0048 of the Specification or paragraph 0080 of the corresponding pre-publication*).

In addition to disclosing the instantly claimed metal substrate, silane solution, and sulfur cured rubber, Van Ooij et al. also disclose the same coating parameters utilized in the instant invention, including concentration of the silane solution and length of contact time between the solution and the metal. By Applicant's own admission, *a 5% silane solution* contacted with the metal for *at least about 30 seconds* generally provides a film thickness of *about 0.3 μm to about 0.4 μm* after drying. Furthermore, it should be noted that there is no evidence to suggest that this relationship between coating parameters and coating thickness is exclusive to the instant

invention. In light of this, it appears that the method of Van Ooij et al. would have inherently provided a coating thickness in the range from about 0.1 μm to about 1 μm (*preferably in the range from about 0.2 μm to about 0.6 μm*). Otherwise, the method of Van Ooij et al. would have rendered the instant invention obvious because their method yields a composite material featuring improved adhesion characteristics between a metal substrate and a sulfur cured rubber (*see Summary of Invention and Example 1 of Van Ooij et al.*)

Therefore, if not explicitly taught by Van Ooij et al., then the method of Van Ooij et al. would have rendered the instant invention obvious because their method yields a composite material featuring improved adhesion characteristics between a metal substrate and a sulfur cured rubber.

Claim Rejections - 35 USC § 103

25. Claim 41 rejected under 35 U.S.C. 103(a) as being unpatentable over {Van Ooij et al. (WO 00/63462) or Van Ooij et al. (US Pat. No. 6,416,869) or Van Ooij et al. (US Pat. No. 6,756,079)}.

Regarding claim 41, Van Ooij et al. disclose a drying step (*see: page 24, lines 16-19; column 15, lines 4-9; column 15, lines 6-10*) of their 5% (*silane*) solution featuring 5% silane, 5% water, and 90% alcohol, such as ethanol or methanol (*see: page 24, lines 3-15; column 14, line 54 through column 15, line 3; column 14, line 56 column 15, line 5*). However, they fail to explicitly disclose: **(41)** wherein drying comprises heating the silane solution on the metal substrate to a temperature of *at least about 60°C*.

It should be noted that the boiling points of water, ethanol, and methanol are all above 60°C. Therefore, a drying temperature of *at least about 60°C* would have been an obvious choice for the skilled artisan to drive off the water and alcohol in a reasonable time frame.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a drying temperature of at least about 60°C in the method of Van Ooij et al. because they use a 5% (*silane*) solution featuring 5% silane, 5% water, and 90% alcohol, such as ethanol or methanol. This drying temperature would have been an obvious choice for the skilled artisan to drive off the water and alcohol in a reasonable time frame because the boiling points of water, ethanol, and methanol are all above 60°C.

26. Claims 36-40, 46-55, and 99 are rejected under 35 U.S.C. 103(a) as being unpatentable over {Van Ooij et al. (WO 00/63462) or Van Ooij et al. (US Pat. No. 6,416,869) or Van Ooij et al. (US Pat. No. 6,756,079)} in view of Shimakura et al. (US Pat. No. 6,475,300).

Regarding claims 36-40, the teachings of Van Ooij et al. are silent regarding: **(36)** the presence of a nano-size particulate material in the silane solution; **(37)** wherein the nano-size particulate material is selected from the group consisting of silica, zinc oxide, and combinations thereof; **(38)** wherein the nano-size particulate material has an average particle size of about 0.1 μm or less; **(39)** wherein the nano-size particulate material is silica in a concentration range from about 10 ppm to about 1% by weight of the solution; and **(40)** wherein the nano-size particulate material is silica and in a concentration range from about 50 ppm to about 1000 ppm of the solution. It should be noted that this particulate filler is an *inert material* which would not have participated in or interfered with (*the chemical reactions of*) the bonding mechanism of Van Ooij et al.

Shimakura et al. also disclose a silane-based intermediate (*primer*) layer for metal substrates (Abstract; column 2, lines 29-32). After the silane-based treatment is applied, a topcoat is applied, wherein the silane-based coating imparts corrosion resistance to the metal substrate. In addition to their silanes, they disclose, "The metallic surface-treatment agent of the present invention comprises water-dispersible silica. The water-dispersible silica which can be used is not particularly restricted...The spherical silica includes colloidal silica such as *Snowtex N*, *Snowtex UP*...The above water-dispersible silica is formulated in a concentration of 0.05 to 100 g/l, preferably 0.5 to 60 g/l...If the concentration of water-dispersible silica is less than 0.05 g/l, the corrosion resistance-improving effect will be insufficient, while the use of silica in excess

of 100 g/l will not be rewarded with any further improvement in corrosion resistance but rather detract from bath stability of the metallic surface-treating agent,” (see column 3, lines 19-40).

The teachings of Shimakura et al. demonstrate the following: (1) that nano-size silica having an average particle size of about 0.1 μm or less (see product sheet for Snowtex products) is recognized in the art as a suitable *inert* additive for silane-based primers, providing enhanced corrosion-resistance properties to the primer; and (2) that the concentration of the silica nano-particles is a result effective variable, ensuring desired corrosion-resistance and bath stability.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide silica nano-particles in an optimized concentration range, as taught by Shimakura et al., in the solutions of Van Ooij et al. because the teachings of Shimakura et al. demonstrate: (1) that nano-size silica having an average particle size of about 0.1 μm or less (see product sheet for Snowtex products) is recognized in the art as a suitable *inert* additive for silane-based primers, providing enhanced corrosion-resistance properties to the primer; and (2) that the concentration of the silica nano-particles is a result effective variable, ensuring desired corrosion-resistance and bath stability.

Regarding claims 46-55, and 99, the combined teachings of Ooij et al. and Shimakura et al. are as set forth above and incorporated herein to obviously satisfy all of the limitations set forth in claims 46-55 and 99.

Double Patenting

27. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

28. Claims 26-35, 41-43, and 97 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the combined limitations of claims 7-19, 24-31 & 33 of U.S. Patent No. 6,756,079.

29. Claims 36-40, 46-55, and 99 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the combined limitations of claims 7-19, 24-31 & 33 of U.S. Patent No. 6,756,079 in view of Shimakura et al. (US Pat. No. 6,475,300).

The inherency and obviousness rejections over Van Ooij et al. are as set forth above and incorporated herein. The obviousness rejection over Van Ooij et al. in view of Shimakura et al. is as set forth above and incorporated herein.

The patented claims are deficient in that they do not disclose the following: (a) the mixing sequence of instant claims 27 & 46; (b) the thickness limitations of instant claims 26, 42,

46 & 55; (c) the dipping technique of instant claim 35; (d) the nano-particle limitations of instant claims 36-40, 46 & 52-54; (e) the temperature limitation of instant claims 41; and (f) the heat & pressure limitations of instant claim 43.

With respect to (a), this mixing sequence would have been clearly envisaged by the skilled artisan in light of the specification (*see column 6, lines 54-58; Example 1*) – see MPEP 804 II. B. 1. & *In re Vogel*, 422 F.2d 438, 441-42, 164 USPQ 619, 622 (CCPA 1970).

With respect to (b & c), the thickness limitations and dipping technique would have been clearly envisaged by the skilled artisan in light of the specification (*see column 8, lines 28-45; Example 1*) – see MPEP 804 II. B. 1. & *In re Vogel*, 422 F.2d 438, 441-42, 164 USPQ 619, 622 (CCPA 1970). The exemplary dipping technique would have inherently produced instantly claimed coating thickness for the reasons set forth above in the inherency rejection.

With respect to (d), the nano-particle limitations would have been obvious in view of Shimakura et al. for the reasons set forth above in the obviousness rejection.

With respect to (e), the temperature limitation would have been obvious for the reasons set forth above in the obviousness rejection (*see Example 1*) – see MPEP 804 II. B. 1. & *In re Vogel*, 422 F.2d 438, 441-42, 164 USPQ 619, 622 (CCPA 1970).

With respect to (f), the heat & pressure limitations would have been clearly envisaged by the skilled artisan in light of the specification (*see Example 1*) – see MPEP 804 II. B. 1. & *In re Vogel*, 422 F.2d 438, 441-42, 164 USPQ 619, 622 (CCPA 1970).

Communication

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Feely whose telephone number is (571)272-1086. The examiner can normally be reached on M-F 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Y. Pyon can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael J Feely/
Primary Examiner, Art Unit 1796

March 11, 2008